

What is claimed is:

Sub A1  
1. A copolymer comprising:

- 5 a) 4 to 50 percent by weight of (meth)acrylic acid units; and  
b) from 50 to 95 percent by weight of at least one non-acid ethylenically unsaturated monomer.

2. The copolymer of claim 1 comprising at least 10 percent by weight of (meth)acrylic acid units.

3. The copolymer of claim 1 comprising at least 15 percent by weight of (meth)acrylic acid units.

4. The copolymer of claim 1 wherein said non-acid ethylenically unsaturated monomer is selected  
10 from the group consisting of styrene, vinyl acetate, methyl methacrylate, butyl acrylate, methyl  
acrylate, acrylonitrile, isopropylacrylamide, and mixtures thereof.

5. The copolymer of claim 1 wherein said copolymer is a block copolymer.

6. The copolymer of claim 1 wherein said copolymer is a random copolymer.

7. The copolymer of claim 1 wherein said copolymer is a tapered block copolymer.

8. The copolymer of claim 1 wherein said copolymer has a weight average molecular weight of from  
15 1,000 to 100,000.

9. A single stage free radical retrograde precipitation polymerization process for producing a  
copolymer comprising:

a) admixing

1) a solvent,

2) a free-radical-forming agent,

3) (meth)acrylic acid,

4) and at least one non-acid ethylenically unsaturated monomer;

b) initiating a free-radical precipitation polymerization to form a plurality of polymer radicals;

c) precipitating a copolymer from said polymer radicals;

d) maintaining the admixture of reactants at a temperature above the lower critical solution  
temperature of said admixture; and

e) controlling the reaction conditions of said admixture to control the rate of propagation of the  
polymer.

10. The process of claim 9 further comprising a delayed and/or continuous feed of monomer and

initiator during the reaction run.

11. The process of claim 9 wherein said non-acid ethylenically unsaturated monomer is selected from the group consisting of selected from the group consisting of styrene, vinyl acetate, methymethacrylate, butyl acrylate, methyl acrylate, acrylonitrile, and isopropylacrylamide.

5 12. The process of claim 9 wherein said copolymer is formed from monomers having reactivity ratios between 0.001 and 100.

13. A free radical retrograde precipitation polymerization process for producing a block copolymer comprising:

a) admixing

10 1) a solvent,

2) a free-radical-forming agent,

3) at least one ethylenically unsaturated monomer;

b) initiating a free-radical precipitation polymerization to form a plurality of polymer radicals;

c) precipitating a polymer from said polymer radicals;

15 d) maintaining the admixture of reactants at a temperature above the lower critical solution temperature of said admixture;

e) controlling the reaction conditions of said admixture to control the rate of propagation of the polymer;

20 f) rapidly cooling the reactor contents to below the lower critical solution temperature, following at least 3 times the initiator half life to produce the first monomer into polymer,

g) admixing a second monomer mixture containing at least one ethylenically unsaturated monomer into the cooled reactor contents;

h) heating the reactor contents above the lower critical solution temperature to continue polymerization.

25 14. The process of claim 13 wherein said rapid cooling occurs by removing the reactor contents through a cooled tube and into a second vessel.